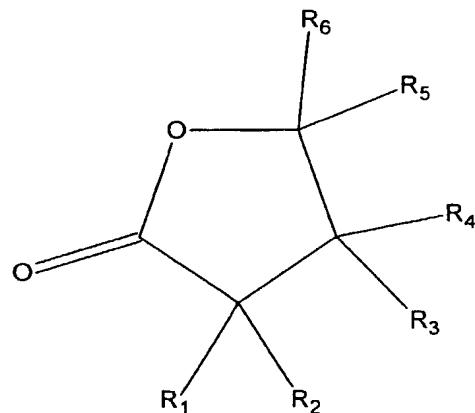


C L A I M S

1. A process for the liquefaction of lignocellulosic or cellulosic material, wherein solid lignocellulosic or cellulosic material is heated at a temperature in the range of from 100 to 300 °C in the presence of an acid catalyst and a solvent, wherein the solvent-to-solid material weight ratio is at most 50, the acid catalyst is present in a concentration of at most 50% by weight of acid based on the weight of solvent and acid, and the solvent comprises a compound having a gamma lactone group

10 of the general molecular formula



(1)

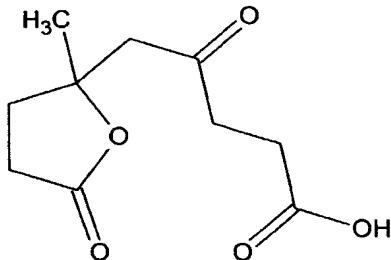
wherein R₁ to R₆ each represent, independently, a hydrogen atom or an organic group connected with a carbon atom to the lactone group.

2. A process according to claim 1, wherein R₁, R₂, R₃ and R₄ each are a hydrogen atom.

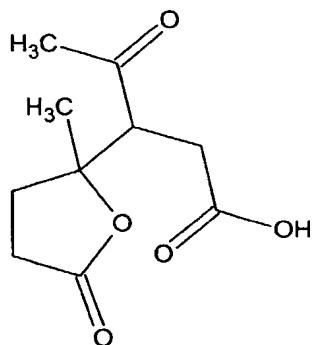
15 3. A process according to claim 2, wherein R₅ is a methyl group, preferably a process wherein the compound having a gamma lactone group is gamma valerolactone (R₆

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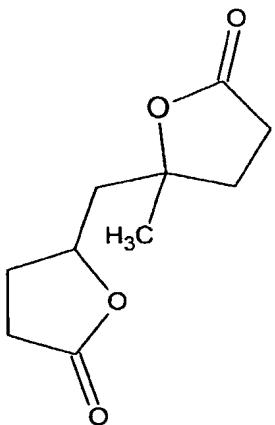
is a hydrogen atom), 2-methyl-5-oxotetrahydrofuran-2-carboxylic acid (R_6 is a carboxyl group), a compound having a molecular structures according to any one of molecular formulas (2) to (5):



(2)

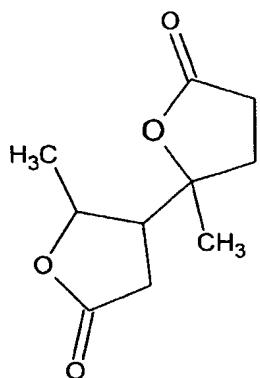


(3)



(4)

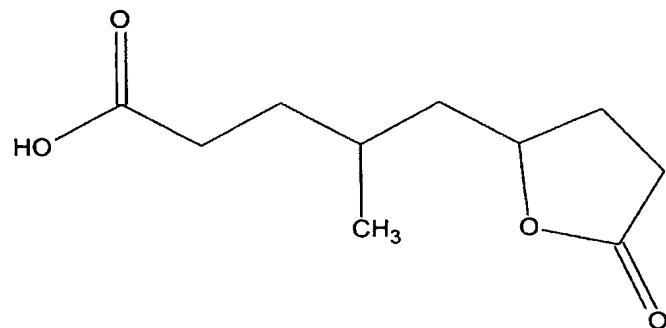
- 18 -



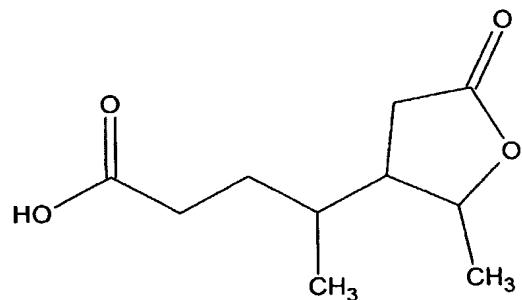
(5)

or an ester of a compound having a molecular structure according to molecular formula (2) or (3).

4. A process according to claim 1, wherein the compound having a gamma lactone group has a molecular structure according to molecular formula (6) or (7):



(6)



(7)

or is an ester of a compound having a molecular structure according to molecular formula (6) or (7).

5. A process according to any one of the preceding claims, wherein the compound having a gamma lactone group is obtainable from levulinic acid by hydrogenation, dehydration, aldolcondensation, dimerisation or oligomerisation, esterification with an alcohol, or a combination of two or more of these reactions.

10 6. A process for the liquefaction of lignocellulosic or cellulosic material, wherein solid lignocellulosic or cellulosic material is heated at a temperature in the range of from 100 to 300 °C in the presence of an acid catalyst and a solvent, wherein the solvent-to-solid material weight ratio is at most 50, the acid catalyst is present in a concentration of at most 50% by weight of acid based on the weight of solvent and acid, and the 15 solvent comprises furfural, levulinic acid or a compound obtainable from furfural or levulinic acid by hydrogenation, dehydration, aldolcondensation, dimerisation or oligomerisation, esterification with an alcohol, or a combination of two or more of these 20 reactions.

25 7. A process according to claim 6, wherein the solvent comprises furfural or a compound obtainable from furfural selected from tetra hydrofurfuryl alcohol, furfuryl alcohol, di-ether of furfuryl alcohol, dimers or oligomers of furfural or furfuryl alcohol.

30 8. A process according to claim 6, wherein the solvent comprises levulinic acid, an alkyl ester of levulinic acid, a C₅ compound obtainable by hydrogenation and/or dehydration of levulinic acid, or a dimer or oligomer of such C₅ compound, in particular of alpha-angelica lactone, a dimer of levulinic acid obtainable by

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aldolcondensation, dehydration and optionally hydrogenation, or an alkyl ester of such dimer.

9. A process according to claim 8, wherein the solvent comprises levulinic acid, alpha-angelica lactone,

5 1,4-pentanediol, 1-pentanol, 4-methyl-6-oxononanedioic acid, the di-methyl or di-ethyl ester of 4-methyl-6-oxononanedioic acid, ethyl levulinate, butyl levulinate, pentyl levulinate, or a combination of two or more thereof.

10 10. A process according to any one of the preceding claims, wherein the solvent essentially consists of one or more of the solvent compounds defined in any one of the preceding claims.

15 11. A process according to any one of the preceding claims, wherein the acid catalyst is a strong mineral or organic acid having a pKa below 4.7, preferably below 3.5, more preferably below 2.5.

20 12. A process according to claim 11, wherein the acid is phosphoric acid or sulphuric acid, preferably phosphoric acid.

25 13. A process according to claim 11, wherein the acid is oxalic acid, 2-oxopropanoic acid, maleic acid, (1E)-prop-1-ene-1,2,3-tricarboxylic acid, 2,3-dihydroxysuccinic acid, furan-2,5-dicarboxylic acid, or a combination of two or more thereof.

30 14. A process according to any one of the preceding claims, wherein the acid catalyst is present in a concentration of at most 20% by weight, preferably of from 0.1 to 10% by weight, more preferably of from 0.5 to 5% by weight.

15. A process according to any one of the preceding claims, wherein the solvent-to-solid material weight

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ratio is in the range of from 3 to 20, preferably of from 5 to 15.

16. A process according to any one of the preceding claims, wherein the temperature is in the range of from 5 120 to 250 °C, preferably of from 150 to 210 °C.

17. A process according to any one of the preceding claims, wherein the pressure is in the range of from 0.1 to 15 bar (absolute), preferably in the range of from 0.5 to 10 bar (absolute), more preferably in the range of from 0.8 to 3 bar (absolute), most preferably is ambient pressure.